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VOL. XIX., 1932-33.5.—SPECIFIC NAMING OF AULOSTEGES FROM WESTERN  
AUSTRALIA.

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## INTRODUCTION.

Identification of new specimens of the genus *Aulosteges* from Western Australian formations has been found unsatisfactory owing to the variety of different fossils which have been described or recorded under the species *A. baracoodensis*, Eth. jun. Unfortunately the type specimen of this species is not to be found in Western Australian collections. It has therefore been thought advisable to figure the cotype with further notes on the definition of the species and its distinction from other Western Australian *Aulosteges* and also to give notes on specimens later recorded under the species *A. baracoodensis* with suggested revision of their naming.

*Aulosteges baracoodensis* (restricted) Eth. jun.

Pl. I., figs. 1a-c; Pl. II., figs. a & b.

1903—*A. baracoodensis*, Eth. jun., G.S.W.A. Bull. 10, p. 22, pl. II., figs. 1-2a.

The same specimens are recorded in G.S.W.A. Bull. 26, p. 55; Bull. 33, p. 12; Ann. Prog. Rept. 1901, p. 12.

Etheridge describes and figures a specimen from Baracooda Pool on the Arthur River (F178, 4760. Geol. Surv. W.A.) and mentions a specimen from the Wooramel River (F1569 Mining Museum, Sydney). Of these the type from Baracooda Pool is not to be found. The cotype has been kindly lent by the authorities of the Mining Museum.

The most noticeable character of this specimen is the shallowness of the valves. Etheridge describes the ventral valve as "more or less convex but not inflated," and his figure of the type shows a broad depressed shell differing markedly from the highly inflated subquadrate shells commonly assigned to *Productus subquadratus* which are fairly frequent in Western Australian Carboniferous rocks. Although both the Wooramel specimen and the figure of the type show a certain amount of crushing, the degree of deformation of the shell is not nearly as pronounced as it would have been had the shell been at all inflated.

The same shallow form is shown by two half specimens in the collection of the University of Western Australia (No. 10496) which are presumed to belong to the same individual and which agree well with the description of *A. baracoodensis*.

It seems therefore that this shallowness is a characteristic of the species *baracoodensis*.

Both specimens show a pronounced increase in breadth towards the anterior margin.

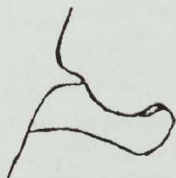
Etheridge's original description is as follows:—

"Sp. Char.—Shell large, rotundo-quadrate, longer than wide, concavo-convex, the convexity of low degree; cardinal margins much shorter than



the greatest width of the shell; auricles not highly developed, coincident with the curvature of the valves; cardinal angles obtusely rounded, neither quadrangular nor emarginate; lateral and ventral margins rounded, the latter faintly insinuated centrally. Ventral or pedicle valve more or less convex but not inflated, and with a faint sinus; umbonal region high, the umbo blunt and barely overturned; area high, approximately from half to one-third the width of the cardinal margin, transversely lined but not distorted; delthyrium high and linear; deltidium very narrow, annulate but not spined or twisted. Brachial or dorsal valve concave; cardinal area linear; cardinal process small and spike-like externally; septum rather strong and showing through the test, extending for two-thirds the length of the valve. Sculpture in both valves of concentric latilaminae, thickly set with tubular spines, arising from irregularly developed low costae; spines when broken or worn leaving perforated tubercles."

The cotype does not show all these characters. The auricles are more or less displaced by crushing, but though not highly developed do not seem to be quite coincident with the curvature of the valves. The cardinal angles are scarcely "rounded" but they are obtuse angles. There is no sculpture of concentric latilaminae but concentric growth laminae are pronounced towards the margins of both valves. The area has been crushed and broken but was evidently high and extended across at least two-thirds of the width of the cardinal margins. Where the area has been broken the cardinal process is exposed. Although this is small and spike-like externally, *i.e.* on its dorsal surface, it enlarges rapidly towards the ventral surface so that at its base, near the cardinal margin, it is extremely massive and from the exposed part appears to be triangular in cross section. From this massive pyramid a narrow prong extends up into the umbo and as far as can be seen from this specimen ends in two callosities (see text, fig. 1).



Text Fig. 1.—Cardinal process of *Aulosteges baracoodensis*, side view, drawn from the cotype F1569. See also Plate I., Fig. 1c.

The broken specimen in the University collection, which agrees so well with the cotype in shape and ornamentation, has the area well preserved. This is slightly lower and wider than that of Etheridge's figured type and extends for about three quarters the length of the cardinal margin. It is transversely lined. The pseudo-deltidium narrows to an acute point under the umbo. It is devoid of spines but composed of transverse laminae which under the microscope give it the "annular" appearance of Etheridge's figure 2a. The small portion of the cardinal process seen on the exterior has the spike-like appearance shown by the figure of the type  $\alpha$ - $\beta$  by the cotype before the matrix was removed from the areal portion. An additional feature shown by this specimen is the presence of closely set slender spines over half a centimetre in length still attached to the dorsal valve.

As the only character in which this specimen differs from the specimen and figures of *A. baracoodensis* is the slightly wider area it must be included in this species.

Measurements.	Cotype. Wooramel R.	Broken Specimen. ?Fossil Cliff Irwin R.
	mm.	mm.
Length of ventral valve .. .. .	82	67
Length of dorsal valve .. .. .	67	56
Length of hinge line .. .. .	47	about 45
Maximum breadth .. .. .	78	about 73
Height of area .. .. .	about 5	3.5
Length of cardinal process beyond cardinal margin .. .. .	about 9	
Depth of shell measured from flat surface held across dorsal valve .. .. .	about 17	about 14
Thickness of combined valves (both specimens slightly crushed) .. .. .	about 6	about 3

Summarising the characteristics of *A. baracoodensis*, these are:—

- (1) broad shallow valves with maximum breadth towards the anterior margin;
- (2) hinge line about two-thirds as long as greatest breadth of shell;
- (3) area not extending the whole width of hinge;
- (4) pseudodeltidium laminar, without spines;
- (5) cardinal process very large with massive triangular part at base (this character, however, may not be restricted to this species);
- (6) ornamentation of fine spines, concentric growth laminae near margins.

*Aulosteges baracoodensis*, var. *septentrionalis*, Eth. jun.

A series of specimens from Cape Dombey, Northern Australia, were described by Etheridge (Suppl. Parl. Paper No. 55 of 1906 South Australia p. 5) as variety *septentrionalis* of the species *A. baracoodensis*.

One of these specimens has been kindly lent to me by the Australian Museum, Sydney. It is interesting to notice that these have apparently the same shallow form as *A. baracoodensis*. They differ from it in having a flat dorsal valve, coarser and more regularly arranged spines and a cardinal process apparently without the long extension into the umbo shown by that of the cotype of *A. baracoodensis*.

REVISION OF FURTHER SPECIMENS RECORDED UNDER THE NAME *A. BARACOONDENSIS*.

*Aulosteges* sp.

Reference:—W. D. Campbell, G.S.W.A. Bull. 38, 1910, p. 52.

This specimen (F12 Geol. Surv. W.A.) is the umbonal portion of a ventral valve, very irregular due to malformation during growth. It is highly inflated at the umbo, which is strongly overturned and distorted. The area is high but almost obscured by the twisted umbo and by crushing of the shell.



The hinge margin is thickened and recurved. Altogether it shows no likeness to *A. baracoodensis*. It may be compared to *A. spinosus*\* which it resembles in having an open delthyrium and peculiarly upturned or "rolled" cardinal margins.

Locality: Irwin River.

*Productus subquadratus* and *Aulosteges* sp. cf. *A. spinosus*.

Reference:—R. Etheridge jun., G.S.W.A. Bull. 58, p. 33, pl. IV., figs. 11-13.

Two specimens are mentioned, both of which were later referred by Dr. F. Whitehouse (Austr. Assn. Adv. Sci. XVIII, 1926, p. 283 footnote) to "Taeniothaerus," an undescribed genus.

Of these two specimens No. 10929 from North of Barrabiddie is the original of Etheridge's figures 11 and 13. Apart from the ornamentation of spines it shows no characters in common with *A. baracoodensis* as it is a highly inflated shell without any pronounced widening towards the anterior margin. Etheridge says that the peculiar overturned umbo quite conceals the area. However it is doubtful whether an area is present at all. It seems advisable to refer this specimen to *Productus subquadratus*.

The second specimen, 10930, from Mt. Marmion, the original of figure 12, is also an inflated shell and has a pronounced median sinus. It may be referred to the genus *Aulosteges* as it possesses an area and the hinge margin is without teeth. The area is small with a wide triangular delthyrium closed only in its posterior third by a small pseudodeltidium. The area is very similar to that of *A. spinosus*. It was originally pointed out (Roy. Soc. W.A. XVII., p. 19) that *A. spinosus* might be the young shell of *A. ingens*. It is far more likely, however, that if *A. spinosus* represents a young form that this specimen 10930 is a mature form of the same species.

#### *Dorsal valves of productid?*

Reference:—R. Etheridge jun., in Basedow's Narrative of Exploration in North-West Australia. Roy. Geog. Soc. S.A., Vol. XVIII., p. 253.

Portions of valves of *A. baracoodensis* are recorded from the Lower horizon at Mount Marmion. One of these, F16779, a nearly complete dorsal valve, has been lent to me by the Australian Museum. This differs considerably from the dorsal valve of *A. baracoodensis* as it is almost rectangular and considerably broader than long, the broadest part being at the hinge line. The region of the cardinal process is broken away in this shell.

It does not seem possible to give even a generic name to this specimen.

#### UNTRACEABLE SPECIMENS.

*A. baracoodensis* has also been recorded from—

- (a) ?28 mi. S.E. of Gascoyne Junction on the road to Dairy Creek Station. Recorded in a list in Observations on Geology and Geography of North-West and Desert Basins, F. Clapp, Proc. Linn. Soc. N.S.W., Vol. L., pt. 2, 1925, p. 55. There is no specimen at present in the collection on which this list was based, which is recognisable as *A. baracoodensis*.

\* Roy. Soc. W.A., Vol. XVII., p. 17.



- (b) Upper reaches of the Wooramel River between Carandibby Ranges and Bilung Pool. Recorded by A. Gibb Maitland. Summary of Geology of Western Australia, G.S.W.A. Extr. Mining Handbook, p. 36. The present location of this specimen is unknown.

#### OTHER SPECIES OF AULOSTEGES FOUND IN WESTERN AUSTRALIA.

*Aulosteges ingens*, Hosking. (Roy. Soc. W.A., Vol. XVII., 1931, p. 15).

This differs from *A. baracoodensis* chiefly in the depth of the valves contrasted with the shallowness of *A. baracoodensis*; also in the possession of a longer hinge line relative to the greatest breadth of the shell, a slightly coarser ornamentation and a pseudodeltidium which is not laminar.

*Aulosteges spinosus*, Hosking. (Roy. Soc. W.A., Vol. XVII., 1931, p. 17).

Only small ventral valves are known. These differ from *A. baracoodensis* mainly in having a wide delthyrium and very small pseudodeltidium and the cardinal margins "rolled." Resemblance of a larger specimen to these has already been pointed out (p. 36).

*Aulosteges* sp.

Pl. I., figs. 2a-b.

A collection from Luluigui Station, Kimberley Division, includes an incomplete specimen of *Aulosteges* (No. 10492 Univ. of W.A.). In inflation of the valves this specimen is similar to *A. ingens* but differs from it in having the hinge-line shorter than the greatest breadth of the shell and therefore the dorsal valve different in shape from that of *A. ingens*; a faint, low median fold on the dorsal valve; an undistorted area and a narrow, parallel-sided pseudo-deltidium bearing spines.

This specimen may be compared to one figured by Diener (Himal. Foss. Pal. Ind. Ser. XV., Vol. 1, pt. 5, p. 182, pl. VIII., figs. 13-14) as *Aulosteges* cf. *A. gigas*, Netschajew, in the following points:—depth and general outline of the shell; length of the hinge-line relative to the greatest breadth of the shell; the undistorted area; the narrow pseudo-deltidium; the faint indication of a low fold on the dorsal valve. It differs from the Himalayan specimen in ornamentation, which as far as can be seen on the Luluigui specimen consists only of coarse spines.

Another specimen (2779) from the same locality has the umbo curved over concealing the pseudodeltidium.

More specimens are necessary before further identification can be made.

#### ACKNOWLEDGMENTS.

I have to thank the authorities of the Mining and Australian Museums, Sydney, for the loan of specimens, also Mr. T. Blatchford, Government Geologist of Western Australia, and Mr. L. Glauert, Curator of the Western Australian Museum, for their kindness in allowing me to look over the collections of the Geological Survey and of the Museum.

## Plate I.

Figs. 1a-1c—*Aulosteges baracoodensis*, Eth. jun., No. F15696 cotype.  
a, ventral view; b, dorsal view; c, umbonal portion showing the cardinal  
process after matrix was removed.

Figs. 2a-2b—*Aulosteges* sp. a, dorsal view; b, side view.





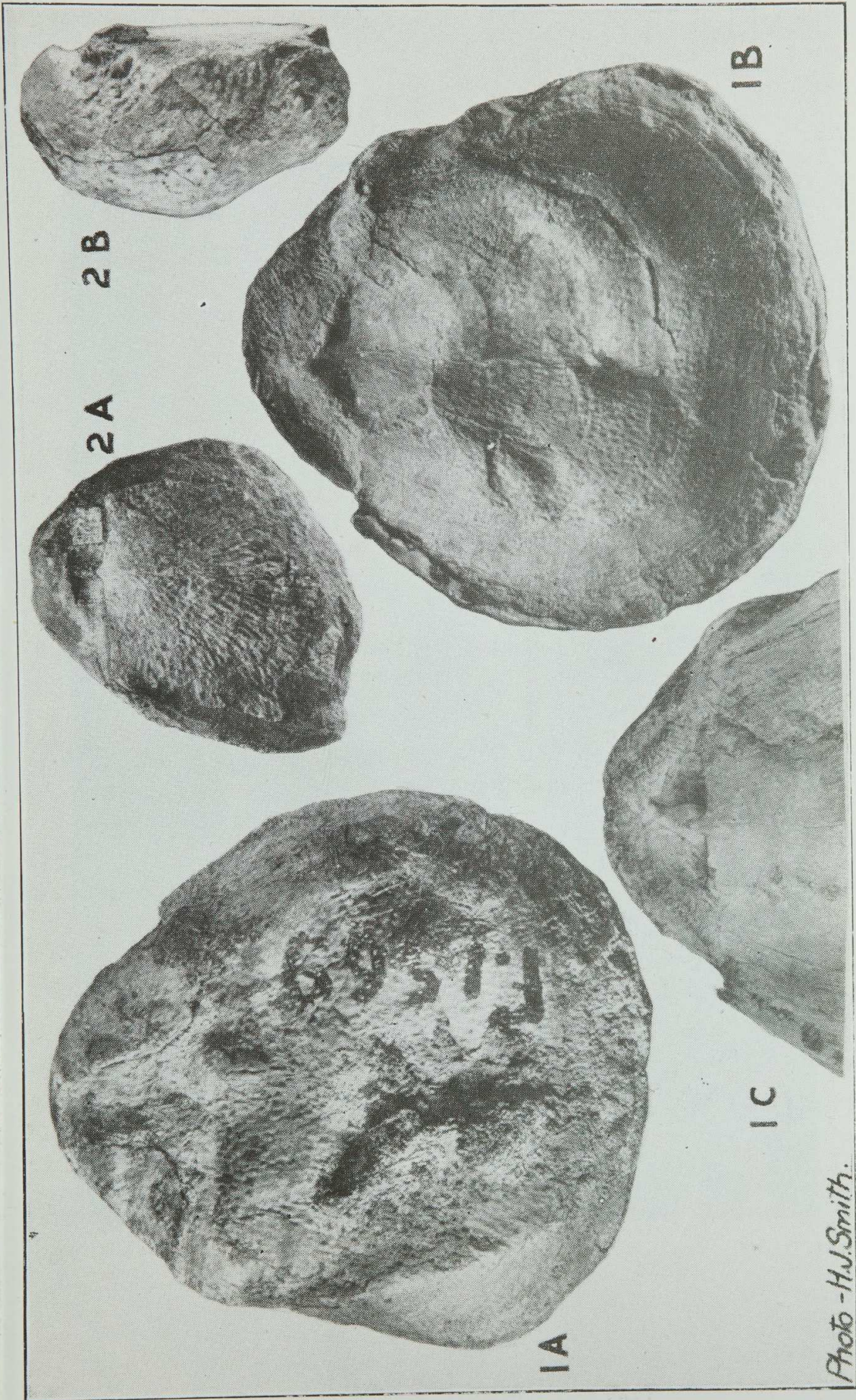


Plate I.

Photo - H.J. Smith.



## Plate II.

Figs. a-b—*Aulosteges laracoodensis*, Eth. jun. Specimen found with tray of fossils from Fossil Cliff, Irwin River. a, ventral view; b, dorsal view.

Note.—Pl. I., fig. 1b and Pl. II., fig. b, should appear concave but owing to the difficulty of photography may at first glance appear convex.







Plate II.